

REMARKS

Claims 12-13, 16, 21-23, 47-59 are presented herein for examination. Claims 12, 16, 21-22 are amended from the priority application, U.S. Patent Application 09/032,254, as indicated. Claims 47-58 reflect amendments from the immediate parent, U.S. Patent Application 09/507,193, of the instant application. Specifically claims 48, 49 and 54 of the above referenced '193 application are amended and presented herein as new claims 48, 49 and 53. Attached hereto is Appendix "A" which provides the Examiner with marked up versions of each of claims 48, 49 and 54 from the '193 application. Both the added claims and the amended claims conform with the agreement reached with the priority Examiner, as described below. Claim 59 is a new claim not subject to the aforementioned agreement

During a telephonic interview conducted on July 16, 2001, the undersigned and priority Examiner Deo reached an agreement regarding a rejection under §112, second paragraph, of claims in the '193 application. At issue was the use of the word "maximum" referring to either width or height. Examiner Deo's position was that what Applicant believed was a maximum dimension, another person might consider a minimum dimension unless some value for maximum was claimed. The undersigned explained that in the context of the '193 application the terms "maximum width" or "maximum height" refer to a largest width or height and not to a specific value for either dimension. Applicant's usage being consistent with the dictionary definition provided in *Merriam-Webster's Collegiate Dictionary*,

T nth Edition, page 718, which is "the greatest quantity or value attainable." Notwithstanding the definition provided, resolution of this impasse was achieved by deleting the word "maximum" from the claims, thus such amended claims were allowed in the '193 application. As some of the claims presented herein for examination are canceled claims from the '193 application that were also subject to the above-referenced rejection, such claims are similarly amended to delete the word "maximum." Applicant respectfully asserts that the scope of such claims is unchanged by the amendment and any limitation of that scope resulting from such amendment is inappropriate.

Rejections under 35 U.S.C. §103(a):

In the Final Office Action of the '193 application, Claims 12, 13, 16, 21-23 and 47 stood rejected under 35 U.S.C. §103(a) as being unpatentable over Crotti (US 4,957,881). In addition, Claims 48-50 stood rejected under 35 U.S.C. §103(a) as being unpatentable over Crotti and further in view of Fazan et al. (US 5,597,756, hereinafter "Fazan"). Such claims, as well as Claims 52-53, presented herein as Claims 51-52, depending from Claim 12, Claim 54, presenting herein as Claim 53, depending from Claim 21, Claims 55-56, presented herein as Claims 54-55, depending from Claim 22 and new Claim 59, are presented herein. Applicant respectfully requests that the examination of such claims be conducted in view of the remarks presented below.

Crotti

Applicant's Claims 12, 21 and 22 each recite, respectively and in pertinent part, "the conductive plug having a first uppermost surface; and unevenly removing material from the first uppermost surface of the conductive plug to define an uneven second uppermost surface," "the beveling changing a first generally even uppermost surface to a second generally uneven uppermost surface" and "the conductive plug having a first uppermost surface having a generally uniform surface and having a width; and etching material of the conductive plug to define a second uppermost surface which is generally non-planar." Thus each of these independent claims, from which Claims 13, 16, 22, 23 and 47 respectfully depend, includes an aspect of changing a first uppermost surface to a second uppermost surface.

In contrast, Crotti, as depicted in Figs. 4-8 defines forming a matrix metal layer 7 and etching such layer 7 using residues of planarization SOG material 8 that is defined along the bottom of valleys of the previously deposited layer 7. As Crotti describes, the etching is conducted for a time sufficient to form the structure shown in Fig. 6 (col. 3, lines 49-58). Thus the structure shown in Fig. 6 has the same uppermost surface as the original, unetched metal layer 7 shown in Fig. 4, SOG material 8 serving as an etch mask or protector for that uppermost surface. In Fig. 7, Crotti teaches forming a dielectric layer 9 overlying the structure of Fig. 6, and in Fig. 8, Crotti teaches the etching of layer 9, which also removes SOG material 8, to expose an uppermost surface of metal layer 7. Crotti never

teach s or even suggests that a conductiv plug is formed having a first uppermost surface which is modified in any manner to form a second uppermost surface as is essentially recited in each of Applicant's Claims 12, 21 and 22.

The priority Examiner responded to the above remarks by stating of Crotti that "Figures 3 and 6 would certainly shows two uppermost surface, the before and after (or claimed 1st and 2nd surfaces)" (second full paragraph on page 5 of the Final Office Action). However, looking at the referred to figures, it is seen that Fig. 3 is "a schematic plan view of a self-aligned contact made in accordance with the [Crotti] invention" (col. 2, lines 12-13), while Fig. 6 is the third of six cross sectional figures that are used to depict the Crotti process (see, *ibid.*, lines 14-15). Thus Applicant respectfully asserts that the priority Examiner's comparison of a plan view of the completed structure, to a cross sectional view of a partially formed structure, is an inappropriate comparison and cannot possibly show two uppermost surfaces, the before and after, as alleged. Furthermore, as Applicant previously stated and as is shown in Fig. 6, metal layer 7 is covered with SOG material 8 thus an uppermost surface of metal layer 7 is completely protected during the etching of other portions of such layer. Such protection is evidenced where Crotti describes that material 8 defines the "length" of the contact by a non-critical masking step (col. 3, lines 23-30), since to retain this defined length, shown in Fig. 3, the uppermost surface of layer 7 CANNOT be etched. Hence Crotti CANNOT and DOES NOT teach or even suggest "unevenly removing material from the first

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uppermost surface of the conductive plug to define an uneven second uppermost surface," "the beveling changing a first generally even uppermost surface to a second generally uneven uppermost surface" or "etching material of the conductive plug to define a second uppermost surface which is generally non-planar" as recited, respectfully, in Claims 12, 21 and 22.

M.P.E.P. §2403.03 states that "[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." Since it is shown that Crotti fails to teach or even suggest at least the above aspects of Applicant's invention recited in Claims 12, 21 and 22, a rejection of any of such claims, or any claim depending from such claims, based on Crotti, is incorrect.

Crotti in view of Fazan et al.

Applicant's Claim 48 recites, among other things, "the conductive contact projections having respective maximum widths and a generally even first uppermost surface; etching at least one of the conductive contact projections effective to reduce its maximum width, and form a generally uneven second uppermost surface."

As remarked above, Crotti DOES NOT teach or even suggest the forming of a first uppermost surface and etching that surface to form a second uppermost surface. Hence Crotti CANNOT teach or suggest the above recited aspect of Claim 48.

Turning to Fazan, the priority Examiner alleged that it would be obvious to one skilled in the art to modify Crotti in light of Fazan since Fazan teaches forming several conductive plugs, and the forming and etching of an insulating layer on the conductive plugs. Fazan does provide a teaching that shows multiple conductive plugs 18A and 18B, forming an insulating material stack 26 and etching stack 26 to form openings 32 that expose an uppermost surface of plugs 18A and 18B. However, Figs. 1-3 indicate that the uppermost surfaces of such plugs are unchanged during the processing. This lack of change is supported by Fazan at col. 3, line 15 - col. 4, line 13, cited by the priority Examiner, as there is no teaching or suggestion that the etching process used to form openings 32 would affect plugs 18A or 18B in any manner. Therefore, Fazan also does not teach or even suggest forming a first uppermost surface and etching that surface to form a second uppermost surface as recited, essentially, by Claim 48.

Contrary to the priority Examiner's allegation, since neither Crotti nor Fazan teach or suggest individually at least this one aspect of Claim 48, it is inconceivable that a combination of Crotti with Fazan could provide such a teaching or suggestion. Thus in accordance with M.P.E.P §2403.03, as cited above, any rejection of Claim 48, or any claim that depends therefrom, must be incorrect if based on Crotti in view of Fazan.

In summary, Applicant having has provided remarks that are germane to each of Crotti and Fazan individually as well as in any combination. Such remarks show that Crotti taken alone or in view of

Fazan DOES NOT provide any teaching or suggestion that can provide the basis of a rejection under §103(a). Hence, Applicant respectfully asserts that Claims 12-13, 16, 21-23 and 47-59 are in condition for immediate allowance, which action is earnestly sought. If, however the Examiner's next action is anything other than a Notice of Allowance, the Examiner is requested to call the undersigned to schedule a telephonic interview. The undersigned is available during normal business hours, Pacific Coast Time..

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PRIORITY Application Serial No. 09/032,254
PRIORITY Filing Date February 27, 1998
Inventor Mark Fischer et al.
Assignee Micron Technology, Inc.
PRIORITY Group Art Unit 1765
PRIORITY Examiner D. Deo
Attorney's Docket No. MI22-1777
Title: Semiconductor Processing Methods Of Forming A Conductive
Projection And Methods Of Increasing Alignment Tolerances

**VERSION WITH MARKINGS TO SHOW CHANGES MADE
ACCOMPANYING SUBSTITUTE PRELIMINARY AMENDMENT**

The claims have been amended as follows. Underlines indicate
insertions and ~~strikeouts~~ indicate deletions.

Cancel Claims 1-11.

12. A method of forming DRAM circuitry comprising:

forming a conductive plug over a substrate node location between a
pair of conductive lines and with which electrical communication with a bit
line is desired, the conductive plug having an a first uppermost surface;
and

~~unevenly removing material from the first uppermost surface~~ of the
conductive plug to define ~~an uneven~~ a second uppermost surface at least a
portion of which is disposed elevationally higher than the conductive lines
and to reduce a width of the conductive plug from what it was prior to said
unevenly removing.

Cancel Claims 14-15.

16. The method of claim 12, wherein the forming of the conductive plug comprises forming the uneven uppermost surface of the plug to have a central region and a corner region joined therewith, and the unevenly removing material ~~of the conductive plug~~ comprises removing more material from the corner region than from the central region of the first uppermost surface.

Cancel Claims 17-20.

21. A method of increasing alignment tolerances between bit line contact material and storage capacitors in a DRAM comprising beveling at least one corner of a conductive plug formed over a diffusion region with which a bit line is to electrically communicate effectively to reduce a width of the conductive plug, the beveling changing a first generally even uppermost surface to a second generally uneven uppermost surface.

22. A method of forming DRAM circuitry comprising:

forming a conductive plug over a substrate node location between a pair of conductive lines and with which electrical communication with a bit line is desired, the conductive plug having ~~an~~ a first uppermost surface having a generally uniform surface and having a width; and

etching material of the conductive plug to define a second uppermost surface which is generally non-planar and at least a portion of which is disposed elevationally higher than the conductive lines and to reduce the width of the conductive plug.

Appendix "A"

(48) 48. A semiconductor processing method of forming integrated circuitry comprising:

forming a pair of spaced and adjacent conductive contact projections over a substrate, the conductive contact projections having respective ~~maximum~~ widths and a generally even first uppermost surface;

etching at least one of the conductive contact projections effective to reduce its ~~maximum~~ width, and form a generally uneven second uppermost surface;

forming insulative material over the conductive contact projections after the etching; and

etching at least one contact opening through the insulative material to at least one of the conductive contact projections proximate the other of the conductive contact projections.

(49) 49. The method of claim 48 comprising etching both of the conductive contact projections to reduce their ~~maximum~~ widths.

(53) 54. The method of claim 21 wherein the beveling is effective to reduce a ~~maximum~~ height of the conductive plug over the diffusion region.

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